

# **DCF Please! Evidence from a Content Analysis of Analyst Reports**

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**Abstract** Using textual analysis for a large sample of analyst reports, we find that analysts are more likely to use DCF model than PE model and engage in more cash flow and discount rate discussions when investors have a stronger demand for value-relevant information. The market reactions to analyst investment opinions based on DCF model are stronger than those based on PE model, especially when the DCF model is accompanied by more cash flow and discount rate discussions. These results indicate that analysts' valuation process reflects investor demand for value-relevant information and has a bearing on the quality of their research.

**Keywords:** Analysts; Valuation; Discounted cash flow (DCF); Cash flow; Discount rate; Content analysis

## 1. Introduction

Despite a large literature on sell-side analyst forecasts, little is known about the valuation process through which analysts convert their earnings and various other accounting item forecasts into target prices and stock recommendations. Since analysts' valuation process is not directly observable, a few studies attempt to infer how analysts convert their earnings forecasts into investment opinions by correlating recommendations and target prices with the implied estimates from some predefined valuation models.<sup>1</sup> Bradshaw (2004) pioneered this line of research by showing that analysts give up using their earnings forecasts in developing stock recommendations, even though recommendations based on earnings forecast valuations relate positively to future stock returns. We use textual analysis for a large sample of analyst reports — the footprint of analyst research — to examine the determinants and the informativeness of analyst valuation models.

We explore three closely related questions. We first examine whether investor demand for value-relevant information drives analysts' use of discounted cash flow (DCF) model instead of price-to-earnings (PE) model<sup>2</sup>. We then examine whether analysts respond to investor demand for more value-relevant information by providing more cash flow and discount rate analysis, the two major inputs into the DCF valuation. Finally, we examine whether investors react differently to analyst investment opinions based on different valuation models.

Our research is important as existing studies on analyst valuation process are subject to a few limitations. First, valuation models identified through model-based inference may deviate from the ones actually used by analysts, as a minor change in model assumptions may cause a large difference in the value estimates (Lundholm and O'keefe 2001). Second, the literature mainly examines earnings-based valuation models such as price-earnings-to-growth (PEG) and

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<sup>1</sup> See, for example, Bradshaw (2004); Barniv et al. (2009), and Gleason et al. (2013).

<sup>2</sup> We define PE model loosely which includes all the earnings multiples such as P/E, PEG, P/EBITDA, EV/EBITDA, EV/EBIT, EV/EBITA, EBITDA/MV, and EV/EBIAT.

residual income valuation model (RIM) but neglect cash flow models, ranked as the second most important model used by analysts (Brown et al. 2015). Third, the context for the analysts' choice of specific valuation models is still unclear. Theoretic models indicate that different valuation models lead to the same valuation if properly implemented. Thus, it is crucial to identify the context and the limitation for the use of a specific model. Finally, due to the lack of data, previous studies provide limited evidence on analyst assessment of valuation details. Asquith, Mikhail, and Au (2005) and Huang, Zang, and Zheng(2014) are among the very few examining the textual information discussed in analyst reports. They find that textual discussions provide incremental information to investors. They, however, do not consider analyst discussions of valuation details, the cash flow and discount rate information in particular.

Based on a textual analysis for a sample of 527,883 financial analyst reports during 1997 to 2015 on 4,957 U.S. firms by 3,196 analysts, we identify the dominant valuation models used by analysts to justify their stock recommendations and target prices. We examine whether investor demand for the underlying firms' value-relevant information affects analysts' use of valuation models. Chen et al. (2013) decompose stock price movement into two components: the change due to cash flow news revisions and the change due to discount rate news revisions. They conclude that both cash flow news and discount rate news contribute to stock price movement. Following this decomposition of stock returns, we expect that the processing of cash flow information and discount rate information be crucial for analysts' valuation process.

Compared with PE model that assumes earnings is proportional to firm value and implies risk assessment in the estimate of P/E ratio, DCF model speaks directly into multi-period cash flow forecasts and the discount rate estimate. Since it is more difficult for investors to interpret, evaluate, and verify less precise information, specific information is more valuable to investors' decisions makings (See Heinle and Smith 2017; Hope et al. 2016). Therefore, we expect investors to value the specific cash flow and discount rate information conveyed through DCF valuation process, especially when they have a stronger demand for such information. As Brown et al.

(2015) find that client demand for information is the most important determinant of analysts' coverage decisions, investor demand for cash flow and discount rate information about the underlying firms has a bearing on analysts' valuation process through their application of DCF model.

We use earnings quality and firm risks to capture the extent of investor demand for cash flow and discount rate information, respectively. We find that analysts are more likely to use DCF model than PE model to value firms with lower earnings quality measured by earnings management and total accrual, and firms with higher risks measured by operational cash flow volatility, negative earnings, and stock return volatility. To further examine the impact of investor demand for discount rate information on analysts' valuation model choice, we attempt to control for investor demand for cash flow information by comparing DCF with price-to-cash flows (PCF) models. Both models rely on the input of cash flow forecasts. DCF model entails, however, an additional input of discount rate which largely reflects the underlying firm risks. We find that the likelihood for analysts to use DCF over P/CF model is not related to earnings quality, but is positively associated with firm risks. Overall, we find that the investor demand for cash flow and discount rate information influence analysts' valuation model decisions.

We then examine whether investor demand for value-relevant information relates to analyst processing of such information. While investor demand for cash flow and discount rate information may motivate analysts to use DCF model to value the underlying firms, the actual processing of such information may be subject to various constraints, such as the ease with which to collect the information, resources available to the analyst, and the cost-benefit analysis of such information collection. To rule out the possibility that DCF analysis is just a label, we resort to textual analysis of analyst reports to capture analysts' processing of cash flow and discount rate information. To the extent that analysts use DCF model in response to investor demand for cash flow and discount rate information, we expect to find analysts make more cash flow and discount rate discussions in their research reports when investors have stronger demand for such

information. Consistent with our predictions, we find strong support that analysts indeed make more cash flow analysis for firms with lower earnings quality, and more discount rate analysis for firms with higher risks.

Finally, we examine whether the informativeness of analyst investment opinions varies with the underlying valuation models. We use market adjusted cumulative abnormal returns within 3 days, 30 days, half a year and one year after the forecast date to capture the informativeness of analyst research. We find that market reactions to the analyst buy recommendations and target price changes based on DCF model are stronger than those based on PE model. Further analysis indicates that the differences in market reactions are more pronounced when analysts engage in more cash flow and discount rate discussions.

In further analysis, we find that the impact of investor demand on the use of DCF model and the discussions of valuation inputs is strengthened when the economic policy uncertain is high and is attenuated when the market sentiment is high. Our main findings remain qualitatively unchanged when we replace DCF model with absolute models which include DCF and other discount-rate based intrinsic valuation models, and replace PE model with multiple-based relative models using various accounting items. Our findings are robust to alternative proxies for analyst valuation details and alternative subsample.

Our paper is most closely related to Asquith et al. (2005) and Demirakos, Strong, and Walker (2010). Asquith et al. (2005) catalog the content of 1,126 reports by 56 star analysts from 1997 to 1999. Their sample shows that almost all reports use an earnings multiple, while only 9.5% of the reports use DCF model. They find that short-term market reaction is related to target prices and analyst's textual justifications, but not to valuation methodology. Demirakos et al. (2010) examine 490 equity research reports for 94 UK-listed firms from 2002 to 2004. They find weak evidence that DCF model outperforms PE model in target price accuracy. Our sample covers a much longer period with a larger sample: there are 527,883 reports on 4,957 U.S. firms during 1997 to 2015 issued by 3,196 analysts. The larger sample size contributes to the power of tests

and the generalizability of our results. More importantly, based on the theoretical motivation for the value drivers, we find consistent evidence that investor demand for cash flow and discount rate information contributes to analysts' supply of such value-relevant information, which facilitates their use of DCF model. Our study contributes to a better understanding of the valuation "black box" called for by Bradshaw (2009).

Our study also extends the study by DeFond and Hung (2003, 2007) who find that analysts tend to make cash flow forecasts when investors demand cash flows to interpret earnings information. Since both cash flow and discount rate information drive the stock price movement, following the logic of DeFond and Hung (2003, 2007), we expect and find that investor demand for value-relevant information motivate analysts to provide more cash flow and discount rate information in their valuation process.

Our study adds to the literature on analysts' assessment of firm risks. Lui et al. (2007) is the first to examine analysts' risk assessment by using analyst risk ratings from Salomon Smith Barney and Citigroup during 1997-2003. They find that analysts' risk ratings are largely explained by firm traits such as size, book-to-market, leverage, earnings quality, losses and idiosyncratic risks. A follow up study by Joos et al. (2016) uses the spread in Morgan Stanley analysts' scenario-based (bull and bear scenarios) valuations to capture analysts' attitude towards firm risks and find that the spread relates positively to firm riskiness such as beta, small size, financial distress, losses and idiosyncratic risk. Our study extends analysts' risk assessment to their valuation process. We find that analysts engage in more discount rate analysis, an overall assessment of firm risks by analysts, for firms with higher risks, especially during high uncertainty period when investors find discount rate information valuable to their decision-makings.

The remainder of the paper is as follows. Section 2 discusses the theoretical framework and our hypotheses. Section 3 describes data and model specifications. Section 4 conducts empirical analysis, and Section 5 concludes.

## 2. Theoretical Framework and Hypotheses Development

### 2.1 Theoretical Framework for Firm Valuation

Our research question is centered on what drives analysts' use of different models in firm valuation. To answer this question, we need to establish 1) what drives the stock price movement and 2) the relationship between valuation models and the value drivers. Chen et al. (2013) theorize that stock prices move because of the revisions in expected cash flows and discount rates. They decompose stock returns into "Cash Flow News" due to cash flow information change and "Discount Rate News" due to discount rates change, and find that both components contribute to stock returns.<sup>3</sup> A major task for financial analysts is to provide target price forecasts and stock recommendations that reflect their expectations of the underlying firms' future stock prices, usually during a horizon of six to 12 months.

Theoretically, both PE and DCF model incorporate analysts' expectations of the underlying firm's cash flows and discount rates. In the PE model valuation process, the firm value is estimated by multiplying the earnings forecasts of the underlying firm with the P/E ratio of the comparable firms or the firm's own historical value. PE model implicitly conveys analysts' expected cash flows and discount rates assessment as follows. First, since stock prices respond to analyst earnings forecast revisions (Griffin 1976; Francis and Soffer 1997; Park and Stice 2000), earnings forecasts capture the marginal investors' expectation of future cash flows. Chen et al. (2013) use analyst earnings forecasts to capture cash flows news in stock return decomposition. Second, the choice of comparable firms and the use of P/E ratios reflect analysts' implicit risk assessment of the underlying firms. Comparable firms are chosen because they have future cash flow expectations proportional and risks similar to the underlying firms. In contrast, DCF model

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<sup>3</sup> The decomposition of stock returns into cash flow news and discount rate news is well documented in the finance literature, such as Campbell and Ammer (1993), Campbell and Shiller (1988), Campbell and Vuolteenaho (2004), Chen and Zhao (2009), and Bansal and Yaron (2004).

relies explicitly on multi-period cash flow forecasts and specific discount rates estimates for the underlying firms.

In practice, the efficiency of PE and DCF models in firm valuation depends on the appropriateness of the underlying assumptions. PE model valuation relies on two major assumptions: earnings are proportional to the firm value, and comparable firms are properly selected. In contrast, the usefulness of DCF model valuation depends on the assumptions that cash flows are proportional to the firm value, and discount rates are reliably estimated. Overall, both PE and DCF models have inherent limitations. Thus it is important to identify the contexts in which DCF model outperforms PE model, or vice versa, in analysts' firm valuation.

Based on the decomposition of stock returns in Chen et al. (2013), we explore whether analysts' tendency to use DCF model over PE model varies with investor demand for cash flow and discount rate information. Compared with PE model, DCF model provides direct cash flow forecasts and explicitly assesses firm risks through the discount rate estimates. We thus expect to find analysts more likely to use DCF than PE model when investors have stronger demand for cash flow and discount rate information. It is possible that analysts respond to investor demand by simply adopting the label of DCF model without providing any incremental valuation information in the report. To address this concern, we investigate whether analysts engage in more cash flow and discount rate discussions (the two major valuation inputs into DCF model) in their research report when investors have stronger demand for such information. Finally, we examine whether investors respond differently to analysts' investment opinions justified by different valuation models. Our ultimate goal is to investigate the impact of investor demand for value-relevant information on the analyst valuation process.



## **2.2 Hypotheses Development**

### **2.2.1 Investor demand for cash flow and discount rate information and analysts' use of DCF model**

Our discussion in Section 2.1 suggests that analysts' tendency to use DCF over PE model may vary with investor demand for cash flow and discount rate information. We elaborate how earnings quality affects investor demand for cash flow information, and firm risks for discount rate information, and how such investor demand for value-relevant information facilitates analysts' use of DCF model.

While some studies find that earnings are superior to cash flows in firm valuation (Dechow 1994; Dechow et al. 1998; Liu et al 2002; Penman and Yehuda 2009), other studies show that cash flows provide incremental information relative to that contained in earnings, especially when earnings quality is low (Bowen et al. 1987; DeFond and Hung 2007). Defond and Hung (2003) find that investor demand for cash flow information increases for firms whose earnings are likely to contain material misstatements, which are less likely to reflect the underlying economic activities. To the extent that low earnings quality adversely impacts the usefulness of PE model, we expect to find that investor demand for cash flow information would motivate analysts to use DCF model which relies crucially on thorough cash flow analysis. When analysts provide cash flow information, they implicitly provide investors their interpretation of the total operating accruals, which help investors to sort out the inferior part of earnings (McInnis and Collins 2011).

We expect investor demand for discount rate information to be stronger for firms with higher risks. This is because possible outcomes are more extreme and consequently have potentially greater impact on stock price for riskier firms. While PE model implies analysts' risk assessment and discount rate estimate through the selection of comparable firms and the use of

P/E ratios, analysts usually conduct thorough risk analysis to derive specific discount rate estimates in the DCF analysis.

Existing studies show that specific information is more valuable to investors, as less precise information is likely more difficult for investors to interpret, evaluate and verify (Bozanic et al. 2013). Heinle and Smith (2017) present a model of risk disclosures and conclude that more precise disclosures imply greater information content and investor attention. Hope et al. (2016) quantify the level of specificity of risk disclosures in the 10-K filings and find it increases the market reaction to the 10-k filings. In addition, they find that specific risk disclosures enhance analysts' reliability in assessing firm risks. Therefore, we predict that investor demand for discount rate information for riskier firms motivate analysts to incorporate their discount rate assessment into the valuation process by using DCF model.

We note that the relation between analysts' tendency to use DCF model and firms' earnings quality and riskiness is not warranted for at least two reasons. First, analyst cash flow forecasts used in DCF model may not be informative to investors, which will reduce the usefulness of DCF model. Although research on analyst cash flow forecasts generally suggests cash flow forecasts provide incremental information to investors (DeFond and Hung 2003, 2007; Call et al. 2013), Givoly et al. (2009) claim that analyst cash flow forecasts are naïve extension of earnings forecasts by simply adding depreciation and amortization expenses back to earnings forecasts. If analyst cash flow forecasts do not provide additional information to earnings, the argument that investor demand for cash flow information from analysts for low earnings quality firms will not hold. Second, an increase in risk and uncertainty makes it tougher to implement the DCF valuation. Analysts need to spend extra efforts to forecast the valuation inputs into DCF model for riskier firms. The increased complexity and uncertainty may weaken analysts' incentives to respond to investor demand by using DCF model.

Ultimately, it is an empirical question whether analysts are more likely to use DCF model for firms with lower earnings quality and higher risks. Our first hypothesis in an alternative form is as follows.

***Hypothesis 1:** Analysts are more likely to use DCF model than PE model to value firms with lower earnings quality and higher risks.*

### **2.2.2 Investor demand and analysts' assessment of cash flow and discount rate information**

While we expect investor demand for value-relevant information motivates analysts to use DCF model, the actual processing of cash flow and discount rate information may be subject to various constraints, such as the ease with which to collect the information, resources available to the analyst for information collection, and the cost-benefit analysis of such information collection. Opportunistic analysts might respond to investor demand by simply mentioning the application of DCF model or using DCF model but without much analysis into underlying cash flows and discount rates. To rule out the possibility that DCF is a label or cheap talk, we further examine whether investor demand for value-relevant information motivates analysts' actual processing of DCF valuation inputs: the cash flow and the discount rate assessment.

DeFond and Hung (2003, 2007) find that analysts are more likely to provide cash flow forecasts for firms whose earnings are likely to be subject to misstatement. Lui et al. (2007) and Joos et al. (2016) show that analysts' risk assessment largely reflect firm characteristics. To the extent that analysts are more likely to use DCF model to satisfy investor demand for value-relevant information and to the extent that the application of DCF model is justified by thorough cash flow and discount rate analysis, we predict that analysts make more cash flow and discount rate discussions for firms with lower earnings quality and higher risks respectively.

Taken together, we expect that investor demand for cash flow and discount rate information motivates analysts to engage in more such information analysis, which finally facilitates analysts' use of DCF valuation model. Our second hypothesis is stated in an alternative form as follows.

***Hypothesis 2:*** *Analysts engage in more cash flow discussions for firms with lower earnings quality, and more discount rate discussions for firms with higher risks.*

### **2.2.3 The informativeness of using DCF model**

We expect that investors will find analyst investment opinions justified by DCF model more informative relative to those based on PE model. First of all, as stated in H1 and H2, DCF model incorporates additional insights into cash flow and discount rate information which are valuable to investors. In addition, DeFranco et al. (2015) find that analysts tend to choose firms with high valuations as peer companies when using relative valuation models. This suggests that the estimate of P/E ratio used in PE model is subject to bias, making PE model less informative compared with DCF model. We investigate the informativeness of analyst investment opinions by examining the market reactions differences to analyst recommendations and target price changes based on DCF model and PE model.

Given the concern that analysts' application of DCF valuation models could be only a label, and do not incorporate much analysis into the underlying firms' cash flows and discount rates. We predict that DCF models accompanied with more cash flows and discount rates discussions are more informative to investors. In other words, the differences in market reactions to analyst investment opinions justified by DCF model and PE model are more pronounced when analysts engage in more cash flows and discount rates discussions.

The above discussion leads to our last hypothesis on the informativeness of valuation models as follows.

***Hypothesis 3:*** *The market reactions to analyst investment opinions based on DCF model are stronger than those based on PE model, especially when DCF model is accompanied by more cash flows and discount rates discussions.*

### **3. Data and Model Specifications**

#### **3.1 Sample Selection**

We retrieve sell-side analyst reports from eight of the top 15 banks in terms of the number of analyst reports available from Investext during 1997 to 2015. We develop a Java program to parse each analyst report to extract the following information: report number, name of the analyst and the brokerage firm, name and trading symbol of the covered company, analyst CFA designation, and stock recommendations, target price forecasts, textual description on valuation process including models, cash flow, discount rate and risk, and total number of words.

We have 676,651 analyst reports from Investext matched to the I/B/E/S, CRSP and Compustat. We delete reports without the disclosure of valuation models and with missing values of variables used in our study. Finally, we restrict our sample to analyst reports which include either DCF or PE as the dominant valuation model. To obtain analyst traits such as their working experience and coverage portfolio, we match Investext reports to the I/B/E/S U.S. database by brokerage firm names, analyst names and the underlying company identifiers that include trading symbols and company names. To ensure matching accuracy, we require the forecast dates in the Investext reports fall between the recommendation forecast announcement dates and review dates from the I/B/E/S. We obtain daily stock prices and returns from CRSP, and financial data from Compustat. We adjust for the discrepancies in the underlying currency among CRSP, the I/B/E/S and Investext by using daily exchange rates from Compustat. Our final sample consists of 527,883 reports on 4,957 U.S. firms from Investext from 1997 to 2015 issued by 3,196 analysts. Appendix A describes our sample selection process.

#### **3.2 Procedures to Identify Valuation Models**

We apply the following procedures to identify the dominant valuation models in analyst reports. We first randomly select 20,000 sentences from more than 10 million sentences extracted

from the cover pages of nearly half a million of analyst reports from the eight banks. We then assign each sentence to at least two research assistants to detect whether a valuation model is explicitly or implicitly used. We end up with around 1,700 sentences that indicate the use of a valuation model. From these sentences, we parse the text of a report to identify the use of a valuation model. We use a keyword search for those sentences that include the use of a valuation model to detect which model is used. The keywords include accounting items that we extract from the sentences that our RAs have flagged for the use of a valuation model and are supplemented with terms from previous studies that indicate the use of a valuation model, such as Gordon Growth model and Enterprise Value Multiple.

Analysts usually mention multiple valuation models in a given report. To identify the dominant models in a report, we search for two sets of keywords that suggest the analyst is relying on a specific model to justify the stock recommendation and/or the target price. The first set of keywords relates to the research outputs of target price and recommendation, which includes the following keywords: *price target*, *target price*, *PT*, *recommend*, and *recommendation*. The second set of keywords relates to an analyst's action of applying a specific valuation model to justify target price and recommendation, including *use*, *using*, *based*, *basing*, *derive*, *derived*, *rating*, and *rate*. In the same sentence that contains a valuation model pattern, if it also contains any of the research output or action keywords listed above, then the valuation model is regarded as the dominant model. If the scheme based on the above two sets of keywords does not reveal any dominant models in a report, then valuation models with a frequency of at least 3/4 of the most frequently used models in the report are considered as dominant models. We describe the procedure of defining dominant methods in Appendix C in detail.

Following Gleason et al. (2013) we classify the valuation models into two broad categories: *relative valuation models* such as price-to-earnings (PE), price-to-book value (PB), price-to-sales (PSAL), and price-to-cash flows (PCF) that are compared with comparable peers to develop a relative value of the underlying company; and *absolute valuation models* such as DCF and RIM

that combine future cash flow forecasts or earnings forecasts with estimated discount rates. Based on the frequency distribution of valuation models from the reports and prior studies, we classify five models under the relative valuation category, including multiples based on earnings, sales, book value, cash flow, and others. Under the absolute valuation category, we include models that are cash flow-based, accrual-based and other types. Please refer to Appendix B for these valuation model classifications and the major accounting items that we use to identify each model.

Our focus is on the comparison between PE model and DCF model as they are representative of relative and absolute models, respectively. In addition, PE model and DCF model are the most frequently used valuation models by analysts (Imam et al. 2013; Brown et al. 2015).

### 3.3 Model Specifications

We test H1 on the determinants of using DCF model by estimating the following logistic regression model:

$$DCF = \partial_1 + \partial_2 EQ + \partial_3 Risk + \partial_4 \sum Controls + \partial_5 Year + \partial_6 Bank + \partial_7 Industry + \varepsilon \quad (1)$$

Where *DCF* is a dummy equal to one if the dominant valuation model is DCF model, and zero if the dominant model is PE model. *EQ* denotes proxies for the demand for cash flow information. We use the abnormal accruals based on Modified Jones Model (*Earnmgmt*) and the absolute difference between net income before extraordinary items and operating cash flows divided by total assets (*Accrual*) to capture investor demand for cash flow information. *Risk* denotes proxies for investor demand for discount rate information, measured with the following three firm risk traits: the standard deviation of quarterly operating cash flows during the past five years (*CF\_std*), *Loss*, an indicator of negative earnings and *Retstd12*, 12 months Standard deviation of daily stock return before analyst report date.

We test H2 on the impact of investor demand on analyst cash flow and discount rate discussions by estimating the following OLS regression models.

$$RepCF = \alpha_1 + \alpha_2 EQ + \alpha_3 \sum Controls + \alpha_4 Year + \alpha_5 Bank + \alpha_6 Industry + \varepsilon \quad (2a)$$

$$RepDR = \beta_1 + \beta_2 Risk + \beta_3 \sum Controls + \beta_4 Year + \beta_5 Bank + \beta_6 Industry + \varepsilon \quad (2b)$$

We measure analyst cash flow discussions in their reports with the number of cash flow keywords (*RepCF*), and analyst discount rate discussions with the number of discount rate keywords (*RepDR*).

We test H3 on the informativeness of valuation models by estimating the following OLS regression models.

$$CART = \gamma_1 + \gamma_2 Signal + \gamma_3 DCF + \gamma_4 Signal * DCF + \gamma_5 \sum Controls + \gamma_6 Year + \gamma_7 Bank + \gamma_8 Industry + \varepsilon \quad (3)$$

Where *CART* is market-adjusted cumulative abnormal return starting one day before to *t* days after the issuance of an analyst report. *Signal* indicates analyst investment opinions. We use *Buy* and *Sell*, the indicators of analyst recommendation types to measure the recommendation opinions and use *TPchg*, the change of analyst target price forecast scaled by the stock price at the beginning of the year, to measure the target price opinions. We test whether the informativeness of DCF model varies with the extent of analyst cash flow and discount rate discussions by partitioning the sample into high and low subsamples according to the yearly median values of *RepCF* and *RepDR*. We then test whether there is a difference in  $\gamma_4$  between the high and low subsamples.

*Controls* refer to a vector of firm, analyst and report characteristics. The firm characteristics include firm size (*Logmv*), sales growth (*Salesgrowth*), systematic risk (*Beta*), and stock return (*Arpre12*). The analyst and report characteristics include the total number of an analyst report words (*Repword*), industry expertise (*Indexport*), firm experience (*Firmex*), recommendation type



(*Buy*), and CFA designation (*CFA*). We also control for year, bank, and industry fixed effects.

Appendix D shows the variable definitions in detail. The standard errors are adjusted for firm and year clustering.

### 3.4 Descriptive Statistics

Table 1 Panel A shows the yearly distribution of the key variables. We find that on average 19% of the analyst reports use DCF as the dominant valuation models to justify recommendations and/or target prices<sup>4</sup>. The popularity of DCF model has increased over years, with an increase from 3% in 1997 to more than 21% in recent years<sup>5</sup>. Given the variations of DCF model over years, we include year fixed effects in all estimations. In addition, we show that on average each analyst report has three words on cash flow analysis and one word on discount rate analysis.

Panel B of Table 1 presents the total number of analyst reports, firms and analysts by Fama-French 12 digit sectors, along with the proportion of using DCF model. Panel B indicates that there is a considerable variation in the proportions of analyst reports using DCF model across industries. For example, while analysts use DCF model for 43 % of their reports to evaluate firms from Telephone and Television Transmission industry, they only use DCF model for 9% of their reports to evaluate firms from the Manufacturing industry. In addition, Panel B shows that the proportion of firms being valued with DCF model and the proportion of analysts using DCF model are the highest in Utilities and Telephone and Television Transmission. Given the variation, we include industry fixed effects in all estimations.

[Insert Table 1 Here]

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<sup>4</sup> In unreported table, we find that 54% of analysts and 55% of firms have ever used DCF model as the dominant model during the sample period

<sup>5</sup> We observe a similar increasing trend of firms valued with (an increase from 6 % in 1997 to 52% in 2015) and analysts using DCF model (an increase from 11% in 1997 to 58% in 2015).

Table 2 Panel A describes the summary statistics of key variables used in our study. The average earnings management is 0.062, and the total accrual is 0.071. For firm risks, it shows that firm operation cash flow volatility is 0.058, and 18% firms experience negative earnings. In addition, the average stock return standard deviation 12 months before the report date is 2.39. 63% of analyst reports include cash flow keywords, and 49% of analyst reports include discount rate keywords.

Table 2 Panel B presents the Pearson correlation analysis of our key variables. The table shows that *DCF* indicator is positively associated with poor earnings quality and high firm risks (except for *Retstd12*). Moreover, it suggests that analyst cash flow and discount rate discussions are positively related to their tendency to use DCF model. We note that the variables within earnings quality and firm risk categories are highly correlated. For example, the correlation between *Earnmgmt* and *Accrual* is 0.644, and the correlations among *CF\_std*, *Loss*, and *Retstd12* are between 0.353 and 0.420. The high correlations suggest that there might be multicollinearity issues when we pool these variables into one regression.

[Insert Table 2 Here]

## 4. Empirical Analyses

### 4.1 Investor Demand for Cash Flow and Discount Rate Information and the Use of DCF Model

Table 3 reports the logistic regressions on the determinants of using DCF model. The dependent variable is *DCF* equal to one if the dominant valuation model in a report is DCF model, and zero otherwise. Column (1) to (2) tests the impact of investor demand for cash flow information on analyst tendency to use DCF model. We find significantly positive coefficients on *Earnmgmt* and *Accrual*, indicating that analysts are more likely to use DCF model for firms with lower earnings quality.

Column (3) to (5) tests the impact of investor demand for discount rate information on analyst tendency to use DCF model. We find significantly positive coefficients on *CF\_std*, *Loss*, and *Retstd12*. The findings indicate that analysts are more likely to use DCF model to value firms with higher risks. In column (6), we pool all the earnings quality and firm risks variables in a regress and the results are qualitatively unchanged. Taken together, we show that analysts tend to use DCF model in response to investor demand for firm's cash flow and discount rate information.

For control variables, we find that analysts tend to use DCF model to value growth firms as proxied by *Salesgrowth*, consistent with the findings in Demirakos et al. (2010). The significant and positive coefficients on analyst report length (*Repwords*) suggest that DCF analysis involves more detailed information provided by analysts. We also find some evidence that analysts tend to use DCF model to justify their buy recommendations. This may be because investors think analysts' buy recommendations are subject to optimistic bias, analysts thus use DCF model to increase the credibility of their favorable recommendations. In addition, we find that the tendency to use DCF model is negatively associated with beta. We also find that analysts with more industry and firm coverage experience are less likely to use DCF model. This is because rich experiences could aid analysts to make efficient judgments in the PE valuation process, such as choosing appropriate peer firms and estimating P/E ratios, which will reduce the usefulness of DCF model over PE model. We find insignificant coefficients on *Arpre12* and *CFA*, suggesting that the likelihood of using DCF model is not associated with the underlying firm's past performance and the analyst CFA designation.

[Insert Table 3 here]

#### **4.2 Investor Demand and Analysts' Discussions on Cash Flow and Discount Rate Information**

Table 4 reports regression results on the impact of investor demand for value-relevant information on analysts processing of cash flow and discount rate information. Column (1) to (2)

tests the impact of firm earnings quality on the number of analyst cash flow discussions in their reports. We document significantly positive coefficients on *Earnmgmt* and *Accrual*, suggesting that analysts engage in more cash flow discussions for firms with lower earnings quality.

Column (3) to (5) tests the impact of firm risks on the number of analyst discount rate discussions in their reports. The coefficients on three risk variables: *CF\_std*, *Loss*, and *Retstd12* are significantly positive, indicating that analysts engage in more discount rate discussions for firms with higher risks. Taken together, Table 4 suggests that analysts' use of DCF model is not a label, but incorporating detailed cash flow and discount rate discussions when investors have stronger demand for such information. Our H2 is supported.

For control variables, we find that analyst processing of cash flow and discount rates is positively associated with firm growth rate (*Salesgrowth*), past abnormal return (*Arpre12*), the length of analyst reports (*Repwords*), and the issuance of buy recommendations (*Buy*). We also document that analysts make fewer cash flow and discount rate discussions for firms with larger size (*Logmv*) and higher beta (*Beta*) and when analysts have richer industry (*Indexpert*) and firm coverage experiences (*Firmexp*). We find no significant evidence that analysts' CFA designation has an effect on their processing of value-relevant information.

[Insert Table 4 here]

### **4.3 Robustness Tests**

#### **4.3.1 Cross-sectional analysis on investor demand for DCF model**

Table 5 Panel A reports the impact of economic policy uncertainty on investor demand for DCF valuation model. Loh and Stulz (2018) find that analyst research is more valuable in bad times since investors rely more on analysts in bad times. Similarly, we expect that investor demand for analyst using DCF model is stronger when the economic policy uncertainty is higher. Using the data from Baker, Bloom, and Davis (2016), we use *EPU* to proxy for the economic policy uncertainty.

Column (1) to (5) tests the impact of *EPU* on the positive relation between investor demand for value-relevant information and analyst tendency to use DCF model. To test the incremental effect under high *EPU*, we interact *EPU* with investor demand for cash flow and risk variables. For simplicity, we put investor demand variables on the top of regressions and use the label *Trait* to stand for *Earnmgmt*, *Accrual*, *CF\_std*, *Loss*, and *Retstd12* respectively from column (1) to (5). We find significantly positive coefficients on the interaction item *EPU\*Trait*, suggesting that high economic policy uncertainty strengthens the effect of investor demand for cash flow and discount rate information on analysts' tendency to use DCF model.

Column (6) to (10) tests the impact of *EPU* on the positive relation between investor demand for value-relevant information and analyst processing of such information. The independent variables are the same as in column (1) to (5). The dependent variable is *RepCF* in column (6) to (7), and *RepDR* in column (8) to (10). The coefficients on the interactions of *EPU\*Trait* are significantly positive, suggesting that analysts engage in more cash flow discussions and discount rate discussions in response to investor demand for such information when the economic policy uncertainty is high. The results in Panel A Table 5 provide corroborating evidence that investor demand for value-relevant information has an impact on analyst valuation process.

Table 5 Panel B reports the impact of market sentiment on investor demand for DCF model. As PE model incorporates the market sentiment in the estimate of P/E ratio, we expect that investor demand for DCF model is weakened when the market is hot. We use *Sentiment*, the University of Michigan consumer sentiment index, to capture the market sentiment. We then repeat the analyses in Panel A by replacing *EPU* with *Sentiment*. The results are reported in Panel B. We find significantly negative coefficients on *Sentiment\*Trait* (8 out of the 10 regressions), suggesting that investor demand for analysts using DCF model and discussing cash flow and discount rate information is attenuated when the market sentiment is high.

[Insert Table 5 here]

#### 4.3.2 Compare absolute model with relative model

In the discussion above, we only consider and compare analysts' use of DCF model and PE model. Table 6 considers all the valuation models used by analysts in their reports. Following Gleason et al. (2013), we classify valuation models into absolute and relative valuation models<sup>6</sup>. As we include all the valuation models, the sample size used in this section is larger than that used in the main analyses. The sample consists of 577,772 analyst reports with 122,647 reports using absolute valuation models and 457,934 reports using relative valuation models<sup>7</sup>.

Panel A in Table 6 reports the distribution of the major valuation models with an average of at least 3% used by analysts in their reports. We observe that DCF model and PE model are the most frequently used models under the absolute and relative model category, one of the reasons why we focus on the comparison between DCF and PE model. Except for DCF model, another frequently used absolute model is NAV model with an average of 4% analyst reports usage. We find that the use of RIM model is almost zero in our sample (not reported in the table), suggesting that prior studies assuming RIM model to be the legitimate way that analysts use their earnings forecasts for recommendations did not capture the actual use of valuation models by analysts. In addition, the small proportion of RIM used by analysts is consistent with Hand et al. (2017) who document that the use of RIM models is only 5% of the use of DCF models. Under the relative model category, we show that PB, PSAL, and PCF models are used by analysts with an average ratio of 4%, 3%, and 3%. Figure 1 shows the distributions of valuation models over years.

Panel B in Table 6 shows the determinants of using absolute over relative models. The dependent variable *Absolute* is an indicator, which equals to one if the dominant valuation model is absolute model and zero if the dominant model is relative model. Investor demand for cash flow and discount rate information variables are the same as in Table 3. Consistent with the

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<sup>6</sup> Please refer to appendix B for the specific valuation models under the absolute and relative model categories.

<sup>7</sup> The reason that the sum of absolute and relative valuation models is larger than the full sample size is because analysts might use both absolute and relative models in one report to justify their recommendations and target prices.

findings in Table 3, we show that analysts are more likely to use absolute models to value firms with lower earnings quality and higher risks.

[Insert Table 6 here]

#### 4.3.3 Compare DCF with PCF model

To further examine the impact of investor demand for discount rate information on analysts' valuation model choice, we control for investor demand for cash flow information by comparing DCF with price-to-cash flows (PCF) models. While both DCF and PCF models rely on the input of cash flow forecasts, DCF entails an additional input of discount rates which largely reflects the underlying firm's risks. Given the major difference between DCF and PCF model lies in discount rate assessment, we expect that analysts' tendency to use DCF over PCF model is positively related to investor demand for discount rate information, but not related to investor demand for cash flow information.

Panel C in Table 6 reports the logit regressions on the likelihood of using DCF over PCF model. We have observations of 122,610 analyst reports, including 101,809 reports using DCF model and 20,801 reports using PCF model. The dependent variable *DCF\_PCF* equals to one if the dominant valuation model is DCF and zero if the dominant model is PCF. Column (1) to (2) shows that the coefficients on *Earnmgmt* and *Accrual* are not significant, suggesting that analysts' tendency to use DCF over PCF model is not related to earnings quality. Both DCF and PCF models could satisfy investor demand for cash flow information for firms with lower earnings quality.

Columns (3) to (5) show that *DCF\_PCF* indicator is significantly positively associated with the three firm risk variables (*CF\_std*, *Loss*, and *Retstd12*), suggesting that investor demand for discount rate information influence analysts' choice between DCF and PCF model. The comparison between DCF and PCF model lends further support to our investor demand hypotheses on analysts' choice of valuation models.

#### 4.3.4 Compare pure DCF and pure PE model

To eliminate the effect of the hybrid models for which an analyst report uses both *DCF* and *PE* as the dominant models, we construct a new variable *PureDCF* which equals one if an analyst report only uses *DCF* as the dominant model, and zero if it only uses *PE* as dominant model.

After excluding analyst reports that use both DCF and PE model as the dominant models, we are left with 475,977 analyst reports, including 49,903 reports only using DCF as the dominant valuation model. In unreported tests, we find that analysts are more likely to use pure DCF model than pure PE model for firms with poorer earnings quality and higher risks.

#### 4.3.5 Alternative measurement of analyst cash flow and discount rate discussions

Analysts from different banks may have the boilerplates to write their research reports. As a result, analysts from certain banks may randomly mention cash flows and discount rates in their reports rather than intentionally discuss the information in response to investor demand. We control for bank fixed effect to address this concern in the previous analyses. In this section, we further address this concern by ranking analyst cash flow and discount rate discussions for each bank-year in quintiles. We thus have two new measurements: *RepCF5d*, the rank of RepCF by bank year, range from 1 to 5, and *RepDR5d*, the rank of RepDR by bank year, range from 1 to 5.

We use tobit regression to repeat the analyses in Table 4. Table 7 reports the results. Consistent with the findings documented in Table 4, we find that the quintile ranks of *RepCF* and *RepDR* are also significantly positively related to poor earnings quality variables and high firm risk variables (except for *Retstd12*) respectively. Overall, our main findings are qualitatively unchanged.

[Insert Table 7 here]

#### 4.3.6 Alternative subsamples

We perform two robustness tests using alternative subsamples. First, we conduct our analysis in the subsample that each analyst follows at least two firms and uses both DCF and PE models in a given year. Second, analysts usually issue multiple reports for a given firm-year. To



reduce the impact of repeated observations, we restrict our sample to one observation per analyst-firm-year. In unreported tests, we show that our main findings are qualitatively unchanged.

#### **4.4. The Informativeness of Analyst Valuation Model**

We predict that investors demand analysts to use DCF model in settings where cash flow information and discount rate information are likely to be more useful in assessing firm value. While the results of our hypotheses tests are consistent with this prediction, this section seeks corroborating evidence by examining whether the market reaction to analyst investment opinions justified by DCF model is stronger than that justified by PE model. Furthermore, we examine whether the market reaction differences are more pronounced when analysts make more cash flow and discount rate discussions.

##### **4.4.1 Stock recommendations**

Table 8 tests the informativeness of analyst valuation model by using recommendations as the investment opinions. Panel A in Table 8 reports the baseline analysis. The dependent variable  $CAR_t$  is the market-adjusted cumulative abnormal return starting from one day before to  $t$  days after the report date. We examine 3 days, 30 days, half a year, and one-year horizons. In Column (1) to (4), we interact both *Buy* and *Sell* indicators with *DCF* in the regressions, but focus on the coefficients of *Buy\*DCF*. This is because sell-side analysts have long been criticized to be optimistic for their earnings forecasts and stock recommendations (Easterwood and Nutt, 1999; Bradshaw et al., 2003). We expect to find that the use of DCF model increases the credibility of the buy recommendation. The coefficients of *Buy\*DCF* are positive in all the four regressions, with a significance level at 5% in Column (1) and (2). Overall, investors react more strongly to the buy recommendations when they are justified by DCF model than those justified by PE model.

The effect of valuation models on analysts' sell stock recommendations can be mixed. If DCF model increases the quality and credibility of analysts' pessimistic forecasts, then the market reactions would be more negative to sell recommendations based on DCF model compared with

those based on PE model. However, if DCF model mitigates the extent to which analysts shy away from pessimistic forecasts and thus leads to more forthcoming releases of pessimistic recommendations, then we expect sell recommendations based on DCF model elicit less negative market reaction compared with those based on PE model. Therefore, the net effect of valuation models on sell stock recommendations is an empirical question. In Column (1) to (2), the coefficients on *Sell\*DCF* are positive, and significantly positive in 3 days horizon, suggesting that the use of DCF model attenuating the negative market reaction to analyst Sell recommendations. However, the coefficients of *Sell\*DCF* turn to be negative with no significance in half a year and one year horizons as shown in Column (3) and (4).

In Column (5) to (8), we interact both *Buy* and *Sell* indicators with *RepCF* to test whether investors value the stock recommendations more when they are accompanied with more cash flow discussions. The coefficients of *Buy\*RepCF* are significantly positive in 3 days and 30 days horizons. We do not find such significance in the half a year and one-year horizons. Overall, it suggests that the market reactions to the analyst buy recommendations are stronger when the recommendations are accompanied with more cash flow discussions.

In column (9) to (11), we test whether investors value the stock recommendations more when they are accompanied with more discount rate discussions. We find that the interaction of *Buy\*RepDR* is positively related to the cumulated abnormal return in 3 days horizon at 1% significance level and 30 days horizon at 10% significance level, and with no significance in half a year and one-year horizons. Overall, we find some evidence that market reactions to the analyst buy recommendations are stronger when they are accompanied with more discount rate discussions.

We also find that firm size and growth rate are significantly negatively related to the market-adjusted abnormal return. We have weak evidence that *Beta* is negatively associated with the *CAR<sub>t</sub>*. This finding is consistent with the mixed findings on market beta and stock returns. For example, Kothari et al. (1995) find that beta is positively related to stock returns, while Fama and

French (1992) find no relation between beta and stock returns, and Easley et al. (2002) find a negative association between the two. The coefficient on *Apr12* is significantly positive because of the price momentum.

Panel B in Table 8 examines whether the market reactions differences observed in Panel A column (1) to (4) are more pronounced when the DCF model is accompanied with more cash flow and discount rate discussions. To test this, we partition the sample into two subsamples according to the yearly median value of *RepCF* and *RepDR* and then redo the analyses in column (1) to (4). For simplicity, we only report the abnormal return in 3 days and one-year horizons. The results in other horizons are qualitatively unchanged. We find that the coefficients on *Buy\*DCF* are significantly positive in the groups with high cash flow and discount rate discussions, and not significant in the low groups. This suggests that DCF model accompanied with more cash flow and discount rate analysis are more valuable to investors.

[Insert Table 8 here]

#### 4.4.2 Target prices

In addition to recommendations, we also test the informativeness of analyst valuation model by using target price changes as the investment opinions in Table 9. Given the missing value of target price and its changes, our sample tested in Table 9 is reduced to 447,940 analyst reports. Panel A in Table 9 reports the baseline analysis. Except in 3 days horizons, the coefficients on *Tpchg\*DCF* are significantly positive, suggesting that market reactions to target price changes justified by DCF model are stronger than those justified by PE model. We also find that the coefficient on *TPchg\*RepCF* and *TPchg\*RepDR* are significantly positively in short horizons, consistent with the evidence that analyst investment opinions accompanied with more cash flow and discount rate analysis cause stronger investors' reactions.

In Table 9 Panel B, we partition the sample into two subsamples according to the yearly median value of *RepCF* and *RepDR*. We find that the stronger market reactions to target price changes riding on DCF model are mainly restricted in groups with high cash flow and discount

rate discussions. The findings further demonstrate that the mere mention of DCF model is not useful to investors. DCF model is valuable unless it is accompanied with detailed valuation inputs analysis.

[Insert Table 9 here]

## 5. Conclusions

This study examines whether investor demand for value-relevant information plays a role in the analyst valuation process. Our study responds to the call from Bradshaw (2011) for more research into *how* analysts perform their tasks, specifically *how* analysts process the information to justify their recommendations and target prices.

Our analyses are based on the theoretical framework by Chen et al. (2013) who find that stock price moves because of the change in cash flow and discount rate news. Compared with PE model, DCF model incorporates explicitly cash flow and discount rate estimates. We expect that investor demand for value-relevant information will motivate analysts to use DCF model rather than PE model to value the underlying firms. In addition, we investigate whether analysts indeed engage in more qualitative cash flow and discount rate discussions with the increase of investor demand for such information. We capture investor demand for cash flow and discount rate information with firm earnings quality and risks respectively.

Using a content analysis for a large sample of analyst reports, we find that analysts are more likely to use DCF model for firms with lower earnings quality and higher risks in response to investors' stronger demand for cash flow and discount rate information for these firms. In addition, we find that analysts make more qualitative cash flow and discount rate discussions when investor demand for such information increases, indicating that analysts actually spend extra efforts in preparing the use of DCF model. Finally, we find that investors react more strongly to analyst investment opinions justified by DCF model compared with PE model.

Additional evidence suggests that the differences are mainly observed in the groups with high analyst cash flow and discount rate discussions.

We acknowledge that this study is essentially exploratory in nature, and has its limitations. In particular, we do not explain the increasing trend of using DCF. In addition, there could be other factors that affect analysts' choice among valuation models but are not identified in our studies. We leave these for future studies.

**Appendix A: Sample selection**

	Number of Reports	Number of Firms	Number of analysts
Analysts' reports from Investext	676,651		
Less: Analysts' reports without disclosure of valuation models	39,639		
less: Missing value of variables	59,428		
Less: If the dominant valuation models are not DCF or PE	49,699		
Final sample	527,883	4,957	3,196

**Appendix B: Classification of valuation methods**

Valuation Model	Key items
<b>Relative models</b>	
Earnings multiples (PE)	P/E, PEG, P/EBITDA, EV/EBITDA, EV/EBIT, EV/EBITA, EBITDA/MV, EV/EBIAT
Sales multiples (PSAL)	P/S, EV/Sale, MV/sale, Revenue
Book value multiples (PB)	P/B, EV/B, MV/B
Cash flow multiples (PCF)	CF/EV, P/CF, DY
Other relative models	MV/Ni, NIBE/MV, RPE, DFE, EV/OIBDA, P/A, Gross Operating Margin, REP, NOA/EV, EV/R&D, Embedded value multiple, ROEg/COEg
<b>Absolute models</b>	
Cash flow based (DCF)	DCF, DDM, GGM, CRR, CFROI, Real Options
Accrual based	NAV, RIM, EVA
Other absolute models	Continuing value, Technology value, Warranted equity model, ARR, Return on embedded value, Return on Capital Employed, Residual Earnings

**Appendix C: Algorithms to identify valuation models from analyst reports**

We notice that analyst usually mention multiple valuation models in each of their research reports. To identify the dominant models in a report, within the sentences that contain the key valuation items as defined in Appendix B, we search for two sets of keywords that suggest the analyst is relying on a specific model to justify the stock recommendation and the target price:

- A. The first set of keywords relates to the research outputs of target price and recommendation which includes the following keywords: price target, target price, PT, recommend, and recommendation.
- B. The second set of keywords relates to an analyst's action of applying a specific valuation model to justify target price and recommendation, including use, using, based, basing, derive, derived, rating, and rate.

If a report satisfies either Algorithm A or B above, the valuation models mentioned in these sentences would be classified as dominant models. In cases where the above coding scheme does not reveal any dominant model, we examine the frequency of valuation model occurrence in the reports. The valuation models with frequency of at least 3/4 of the most frequently used models in the report are defined as dominant models.

We set the distance between the accounting terms (such as P/E, EPS) and the keyword lists (such as target price, base, using) in Algorithm A and B to be within 30 words. For example, there are 9 words between the keyword list "target price" and the accounting term "BPS" below.

*"Our target price through April 2007 is ¥3,155, based on our average BPS estimate for FY2006 and FY2007, and a multiple of 1.4x, the sector average."*

**Appendix D: Variable definitions**

Variable	Definition and data source
<b>Valuation models</b>	
<i>DCF</i>	Dummy equals to one if analysts use DCF model as the dominant valuation model, and zero if the dominant valuation model is PE only.
<i>PureDCF</i>	Dummy equals to one if analysts <i>only</i> use DCF model as the dominant valuation model, and zero if the dominant valuation model is PE only.
<i>DCF_PCF</i>	Dummy equals to one if the dominant valuation model is DCF and zero if the dominant model is PCF.

*Absolute* Dummy equals to one if the dominant valuation model is absolute model and zero if the dominant model is relative model.

***Demand for cash flow information***

*Earnmgmt* Abnormal accruals based on Modified Jones Model in year  $t-1$

*Accrual* Absolute difference between net income before extraordinary items and operating cash flows divided by total assets in year  $t-1$

***Demand for risk information***

*CF\_std* Five years standard deviation of quarterly operating cash flows scaled by total assets before analyst report date

*Loss* An indicator of negative earnings.

*Retstd12* 12 months Standard deviation of daily stock return before analyst report date.

***Analyst cash flow and discount rate Discussion***

*RepCFdum* Dummy equals to one if analysts make cash flow keywords discussions and zero if analysts do not mention any cash flow keywords

*RepCF* The number of cash flow keywords discussed by analysts in their reports

*RepDRdum* Dummy equals to one if analysts make discount rate keywords discussions and zero if analysts do not mention any discount rate keywords

*RepDR* The number of discount rate keywords discussed by analysts in their reports

***Analyst investment opinions and market reactions***

*CARt* Market-adjusted cumulative abnormal return starting one day before to 3 days, 30 days, 183 days and 365 days after the issuance of an analyst report

*Buy* Dummy equals to one if analyst issue an buy recommendation and zero otherwise

*Sell* Dummy equals to one if analyst issue an sell recommendation and zero otherwise

*TPchg* change of analyst target price forecast scaled by the stock price at the beginning of the year

***Control variables***

*EPU* The proxy for economic policy uncertainty from Baker, Bloom, and Davis (2016).

*Sentiment* the University of Michigan consumer sentiment index

*Logmv* The logarithm of firm market value in year  $t-1$ .

*Salesgrowth* Year  $t-1$  revenues less year  $t-2$  revenues scaled by year  $t-2$  revenues

*Beta* Market beta calculated from CAPM model

*Arpre12* 12-month abnormal return before the issue of an analyst' report.

*Repwords* The logarithm of the total number of analyst report words.

*Indexpert* The logarithm of the number of firms in a two-digit SIC industry covered by the analyst in year  $t$

*Firmex* The number of years an analyst has been following a firm

*CFA* Dummy equals to one if an analyst has a CFA designation, and zero otherwise

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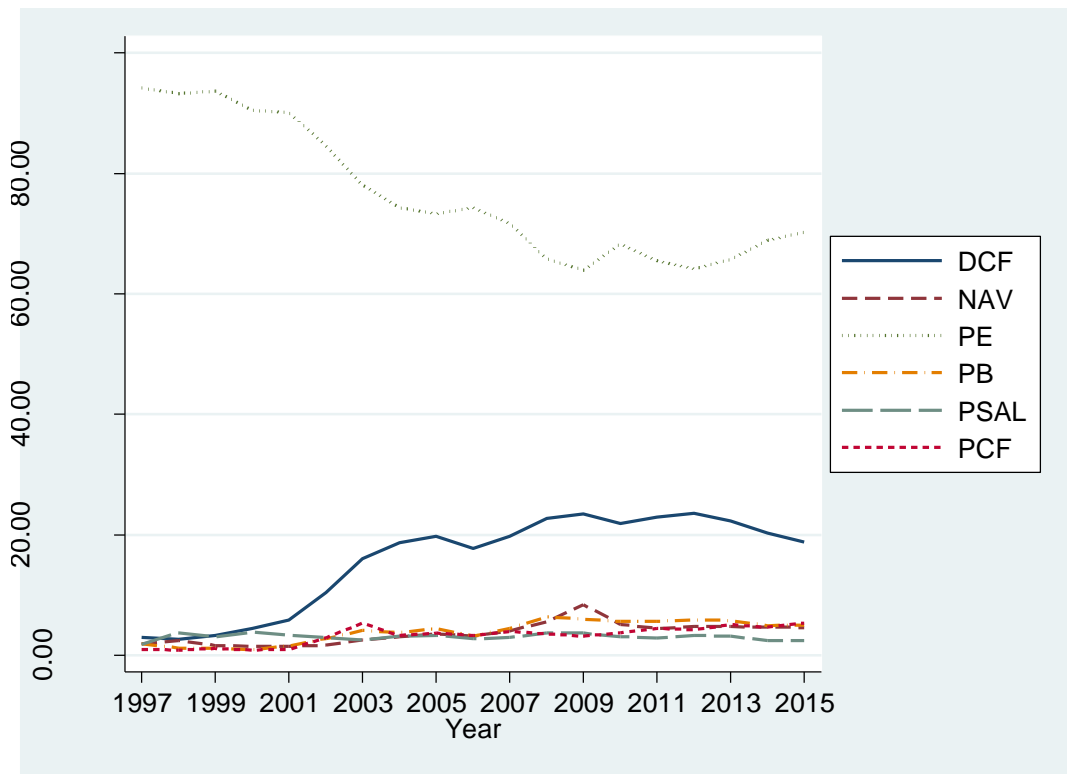


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**Figure 1** The distribution of all the valuation models used by analysts over years



**Table 1**  
**Final Sample Distribution**

Panel A describes the yearly distribution of the number of firms, analysts and analyst reports, the percent of analyst reports using DCF model, the average number of cash flow and discount rate discussions in each analyst report and the mean value of *buy*, *sell* and *Tpchg*. Panel B describes the use of DCF model by industry (Fama French 12 Industry)

*Panel A Distributions by year*

Year	N.Firm	N.Analyst	Analyst Report				Buy	Sell	Tpchg
			N.Rep	% DCF	Avg_RepCF	Avg_RepDR			
1997	1,245	470	3,791	3.03	2.35	0.66	0.72	0.01	0.03
1998	1,569	568	7,604	2.71	1.91	0.55	0.67	0.02	0.00
1999	1,583	626	11,746	3.35	1.88	0.54	0.67	0.01	0.02
2000	1,895	829	23,332	4.65	1.67	0.64	0.76	0.00	0.01
2001	1,981	906	31,826	6.04	1.55	0.63	0.69	0.01	-0.02
2002	1,977	926	35,951	10.98	1.93	0.74	0.57	0.07	-0.03
2003	1,803	822	32,887	17.08	2.78	1.13	0.43	0.12	0.02
2004	1,833	740	37,163	20.07	2.68	1.31	0.45	0.11	0.02
2005	1,970	715	38,447	21.21	2.88	1.47	0.46	0.10	0.02
2006	1,960	621	31,397	19.22	3.03	1.22	0.48	0.09	0.01
2007	2,038	629	32,710	21.59	3.19	1.37	0.50	0.09	0.01
2008	1,960	617	30,853	25.70	3.94	1.57	0.48	0.07	-0.06
2009	1,703	533	26,324	26.87	4.44	1.62	0.46	0.08	0.04
2010	1,720	576	29,737	24.27	4.39	1.54	0.51	0.05	0.03
2011	1,698	571	31,183	25.92	4.16	1.53	0.53	0.05	0.02
2012	1,646	573	30,892	26.88	4.46	1.51	0.51	0.06	0.01
2013	1,659	539	29,041	25.37	4.39	1.52	0.48	0.07	0.04
2014	1,697	537	32,438	22.73	3.73	1.32	0.51	0.05	0.02
2015	1,740	527	30,561	21.16	3.51	1.20	0.50	0.06	0.00
Mean	1,772	649	27,783	19.29	3.21	1.24	0.52	0.07	0.01

*Panel B Use of DCF model by Industry*

Industry	Analyst Reports		Firm		Analyst	
	Number	% using DCF	Number	% using DCF	Number	% using DCF
Business Equipment	110,652	19.98	1,183	53.76	1,081	47.64
Chemicals and Allied Products	17,840	13.74	102	71.57	183	41.53
Consumer Durables	9,507	18.9	86	50	219	41.10
Consumer NonDurables	26,027	24.28	200	65	318	50
Finance	76,004	16.14	820	46.59	676	42.90
Healthcare, Medical Equipment, and Drugs	60,725	24.05	615	55.12	406	51.97
Manufacturing	46,226	9.34	433	45.50	581	39.41
Oil, Gas, and Coal Extraction and Products	26,371	20.66	250	65.60	280	53.21
Other	57,062	19.94	692	53.47	983	48.12
Telephone and Television Transmission	20,095	43.35	218	78.90	275	69.45
Utilities	16,542	26.51	112	85.71	157	56.05
Wholesale, Retail, and Some Services	60,832	13.18	493	51.12	732	38.25

**Table 2 Summary statistics and Pearson Correlations***Panel A Summary statistics (In total 527,883 reports, with 101,809 reports using DCF model)*

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
<b><i>Valuation models</i></b>					
<i>DCF</i>	0.193	0	0.395	0	1
<b><i>Market reactions</i></b>					
<i>CAR3</i>	-1.806	-1.613	7.096	-24.45	18.09
<i>CAR30</i>	-8.369	-6.804	16.75	-58.35	31.11
<i>CAR183</i>	-27.26	-23.88	41.09	-98.56	70.73
<i>CAR365</i>	-34.69	-37.02	51.68	-99.97	104.5
<b><i>Demand for cash flow information</i></b>					
<i>Earnmgmt</i>	0.062	0.036	0.081	0.001	0.485
<i>Accrual</i>	0.071	0.052	0.072	0.001	0.449
<b><i>Demand for discount rate information</i></b>					
<i>CF_std</i>	0.058	0.047	0.049	0.005	0.337
<i>Loss</i>	0.179	0	0.384	0	1
<i>Retstd12</i>	2.386	2.009	1.375	0.776	7.365
<b><i>Analyst cash flow and discount rate discussions</i></b>					
<i>RepCFdum</i>	0.628	1	0.483	0	1
<i>RepCF</i>	3.214	2	4.436	0	23
<i>RepDRdum</i>	0.493	0	0.5	0	1
<i>RepDR</i>	1.24	0	2.127	0	12
<b><i>Other variables</i></b>					
<i>EPU</i>	110.7	101	35.7	57.56	197.9
<i>Logmv</i>	8.385	8.307	1.705	4.579	12.31
<i>Salesgrowth</i>	20.79	10.29	47.37	-47.42	334.4
<i>Beta</i>	1.032	0.983	0.518	0.081	2.46
<i>Arpre12</i>	-30.87	-30.56	54.96	-99.96	126.4
<i>Repwords</i>	7.3	7.41	0.737	5.347	8.779
<i>Indexpert</i>	2.07	2.197	0.749	0.693	3.555
<i>Firmexp</i>	2.306	1.51	2.395	0	11.28
<i>Buy</i>	0.523	1	0.499	0	1
<i>CFA</i>	0.228	0	0.42	0	1

*Panel B Pearson Correlation Coefficients*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)DCF							
(2) Earnmgmt	0.032***						
(3)Accrual	0.043***	0.644***					
(4)CF_std	0.052***	0.407***	0.304***				
(5)Loss	0.052***	0.322***	0.296***	0.353***			
(6)Retstd12	-0.046***	0.368***	0.296***	0.379***	0.420***		
(7)RepCF	0.287***	-0.00100	0.057***	-0.021***	0.014***	-0.060***	
(8)RepDR	0.502***	0.014***	0.022***	0.014***	0.034***	-0.045***	0.575***

**Table 3**  
**The Determinants of DCF model: Investor demand for cash flow and discount rate information**

This table reports the logistic regression on investor demand for using DCF model. The dependent variable is *DCF* which equals to one if analysts mention DCF as dominant valuation model, and zero if analysts only use PE as the dominant valuation model. We use *Earnmgmt* and *Accrual* (*CF\_std*) to capture investor demand for cash flow information, and use firm risk variables like *CF\_std*, *Loss*, and *Retstd12* to capture investor demand for discount rate information. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for firm and year clustering. All continuous variables are winsorized at the 1st and 99th percentile. All variables are defined in Table 1. \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Earnmgmt</i>	1.495*** (5.62)					0.718*** (2.96)
<i>Accrual</i>		1.335*** (4.55)				0.080 (0.27)
<i>CF_std</i>			3.742*** (6.77)			2.879*** (5.73)
<i>Loss</i>				0.406*** (4.99)		0.301*** (4.18)
<i>Retstd12</i>					0.090*** (2.80)	0.023 (0.87)
<i>Logmv</i>	-0.001 (-0.06)	-0.000 (-0.02)	0.011 (0.66)	0.018 (1.03)	0.012 (0.65)	0.037** (1.96)
<i>Salesgrowth</i>	0.002*** (4.88)	0.002*** (6.09)	0.002*** (4.46)	0.002*** (5.60)	0.002*** (6.24)	0.001*** (3.46)
<i>Beta</i>	-0.165* (-1.95)	-0.158* (-1.83)	-0.171** (-2.03)	-0.209** (-2.54)	-0.227*** (-2.61)	-0.253*** (-3.04)
<i>Arpre12</i>	-0.000 (-0.70)	-0.000 (-0.67)	-0.000 (-1.03)	-0.000 (-0.59)	-0.000 (-0.26)	-0.000 (-0.99)
<i>Repwords</i>	0.417*** (7.03)	0.417*** (7.02)	0.418*** (7.03)	0.413*** (7.00)	0.415*** (6.97)	0.415*** (6.99)
<i>Indexpert</i>	-0.079* (-1.84)	-0.085** (-1.99)	-0.081* (-1.91)	-0.081* (-1.93)	-0.077* (-1.80)	-0.083** (-1.97)
<i>Firmexp</i>	-0.053*** (-5.71)	-0.054*** (-5.82)	-0.052*** (-5.51)	-0.055*** (-5.92)	-0.054*** (-5.87)	-0.052*** (-5.53)
<i>Buy</i>	0.061* (1.88)	0.068** (2.11)	0.058* (1.77)	0.058* (1.79)	0.067** (2.09)	0.052 (1.60)
<i>CFA</i>	-0.087 (-1.49)	-0.085 (-1.44)	-0.084 (-1.42)	-0.083 (-1.41)	-0.085 (-1.45)	-0.082 (-1.39)
Constant	-6.134*** (-10.08)	-6.117*** (-9.98)	-6.355*** (-10.54)	-6.136*** (-10.03)	-6.291*** (-10.36)	-6.533*** (-10.70)
<i>Year, Bank, And Industry</i>	yes	yes	yes	yes	yes	yes
<i>Observations</i>	527,883	527,883	527,883	527,883	527,883	527,883
<i>Pseudo R-squared</i>	0.133	0.133	0.135	0.134	0.132	0.137

**Table 4****Investor demand for value-relevant information and Analysts' discussion of cash flow and discount rate information**

This table reports ols regression results on the impact of investor demand for information on analysts' discussion of cash flow and discount rate information. Column (1) to (2) tests the impact of firm earnings quality on the number of analyst cash flow discussions in their reports. The dependent variables are *RepCF*. Column (3) to (5) tests the impact of firm risks on the number of analyst discount rate discussions in their reports. The dependent variables are *RepDR*. In the parentheses below coefficient estimates are robust *t*-statistics adjusted for firm and year clustering. All continuous variables are winsorized at the 1st and 99th percentiles. All variables are defined in Table 1. \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels, respectively.

	(1) RepCF	(2) RepCF	(3) RepDR	(4) RepDR	(5) RepDR
<i>Earnmgmt</i>	0.781** (2.06)				
<i>Accrual</i>		1.673*** (4.97)			
<i>CF_std</i>			1.464*** (3.78)		
<i>Loss</i>				0.236*** (5.33)	
<i>Retstd12</i>					0.036** (2.13)
<i>Logmv</i>	-0.101*** (-4.88)	-0.094*** (-4.49)	-0.009 (-1.12)	-0.001 (-0.17)	-0.008 (-0.83)
<i>Salesgrowth</i>	0.000 (0.40)	0.001 (0.86)	0.001** (2.07)	0.001** (2.14)	0.001*** (2.79)
<i>Beta</i>	-0.687*** (-12.44)	-0.696*** (-12.64)	-0.036 (-1.14)	-0.059* (-1.91)	-0.058 (-1.56)
<i>Arpre12</i>	0.001** (2.50)	0.001** (2.47)	0.000 (0.55)	0.000 (0.76)	0.000 (0.88)
<i>Repwords</i>	2.041*** (17.74)	2.040*** (17.75)	0.797*** (26.43)	0.795*** (26.50)	0.797*** (26.32)
<i>Indexpert</i>	-0.042 (-0.64)	-0.049 (-0.76)	-0.071** (-2.27)	-0.071** (-2.32)	-0.069** (-2.21)
<i>Firmexp</i>	-0.022 (-1.03)	-0.022 (-1.02)	-0.017** (-2.40)	-0.019*** (-2.58)	-0.019** (-2.56)
<i>Buy</i>	0.245*** (7.04)	0.250*** (7.13)	0.063*** (3.53)	0.062*** (3.47)	0.066*** (3.64)
<i>CFA</i>	0.077 (0.65)	0.080 (0.68)	-0.007 (-0.13)	-0.007 (-0.13)	-0.009 (-0.16)
Constant	-11.792*** (-11.00)	-11.880*** (-11.11)	-4.908*** (-12.33)	-4.856*** (-12.20)	-4.900*** (-12.29)
<i>Year, Bank, Industry FE</i>	Yes	yes	yes	yes	yes
<i>Observations</i>	527,883	527,883	527,883	527,883	527,883
<i>R-squared</i>	0.212	0.212	0.144	0.144	0.143

**Table 5**  
**Cross-sectional analyses on investor demand for using DCF model**

Panel A reports the impact of economic policy uncertainty on investor demand for DCF valuation model. The dependent variables in column (1) to (5) are *DCF* which equals to one if the dominant valuation model used by an analyst in the report is DCF model, and zero otherwise. The dependent variables in column (6) to (7) (column (8) to (9)) are the number of cash flow (discount rate) keywords talked by analysts in their reports. *EPU* is the proxy for economic policy uncertainty from Baker, Bloom, and Davis (2016). Panel B reports the impact of market sentiment on investor demand for DCF model. *Sentiment* is the university of michigan consumer sentiment index. We use *Earmgmt* and *Accrual* to capture investor demand for cash flow information, and use firm risk variables like *CF\_std*, *Loss*, and *Retstd12* to capture investor demand for discount rate information. Column (1) to (5) tests the impact of *EPU* (*Sentiment*) on the positive relation between investor demand and the tendency to use DCF model. Column (6) to (10) tests the impact of *EPU* (*Sentiment*) on the positive relation between investor demand and the number of analyst cash flow and discount rate discussions in their reports. From column (1) to (5) and (6) to (10) *Trait* stands for *Earmgmt*, *Accrual*, *CF\_std*, *Loss*, and *Retstd12* respectively. In the parentheses below coefficient estimates are robust *t*-statistics based on standard errors adjusted for firm and year clustering. For simplicity, control variables are included but not reported in the table. All continuous variables are winsorized at the 1st and 99th percentiles. All variables are defined in Table 1. \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels, respectively.

*Panel A Economic policy uncertainty and investor demand for using DCF model*

Dependent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	DCF	DCF	DCF	DCF	DCF	RepCF	RepCF	RepDR	RepDR	RepDR
	<b>Demand for cash flow</b>		<b>Demand for discount rate</b>			<b>Demand for cash flow</b>		<b>Demand for discount rate</b>		
Trait	<i>Earmgmt</i>	<i>Accrual</i>	<i>CF_std</i>	<i>Loss</i>	<i>Retstd12</i>	<i>Earmgmt</i>	<i>Accrual</i>	<i>CF_std</i>	<i>Loss</i>	<i>Retstd12</i>
<i>EPU</i>	0.003*** (2.58)	0.003** (2.34)	0.002 (1.31)	0.004*** (2.76)	0.000 (0.09)	0.009*** (6.12)	0.009*** (5.79)	0.001 (1.10)	0.002** (2.53)	-0.000 (-0.34)
<i>Trait</i>	-1.685* (-1.85)	-0.944 (-1.32)	-1.501 (-0.81)	-0.090 (-0.39)	-0.374*** (-3.44)	-3.176** (-2.06)	-1.897* (-1.68)	-1.575 (-1.63)	-0.052 (-0.42)	-0.186*** (-3.69)
<i>EPU*Trait</i>	<b>0.025*** (2.87)</b>	<b>0.018*** (2.67)</b>	<b>0.045*** (2.76)</b>	<b>0.004** (2.10)</b>	<b>0.002*** (2.83)</b>	<b>0.035** (2.45)</b>	<b>0.030*** (3.06)</b>	<b>0.027*** (2.71)</b>	<b>0.002** (1.97)</b>	<b>0.001*** (2.84)</b>
Controls	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	no	no	no	no	no	no	no	no	no	no
Bank, Industry FE	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883
Pseudo R-squared	0.099	0.098	0.101	0.100	0.100	0.199	0.199	0.133	0.133	0.133



Panel B Market sentiment and investor demand for using DCF model

Dependent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	DCF	DCF	DCF	DCF	DCF	RepCF	RepCF	RepDR	RepDR	RepDR
	<b>Demand for cash flow</b>		<b>Demand for discount rate</b>			<b>Demand for cash flow</b>		<b>Demand for discount rate</b>		
Trait	<i>Earnmgmt</i>	<i>Accrual</i>	<i>CF_std</i>	<i>Loss</i>	<i>Retstd12</i>	<i>Earnmgmt</i>	<i>Accrual</i>	<i>CF_std</i>	<i>Loss</i>	<i>Retstd12</i>
<i>Sentiment</i>	-0.025*** (-5.56)	-0.027*** (-5.41)	-0.024*** (-5.38)	-0.028*** (-6.26)	-0.017*** (-2.88)	-0.036*** (-5.63)	-0.037*** (-5.96)	-0.010*** (-3.96)	-0.014*** (-6.84)	-0.007** (-2.17)
<i>Trait</i>	5.691** (2.37)	3.303 (1.53)	10.839** (2.49)	0.807* (1.85)	0.287* (1.72)	12.525*** (5.85)	10.700*** (5.23)	8.842*** (3.92)	0.931*** (4.48)	0.225** (2.43)
<i>Sentiment*Trait</i>	-0.053** (-1.97)	-0.026 (-1.05)	-0.085* (-1.69)	-0.005 (-0.92)	-0.005** (-2.16)	-0.136*** (-6.01)	-0.108*** (-4.81)	-0.086*** (-3.55)	-0.008*** (-3.57)	-0.003** (-2.53)
Controls	Yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes
<i>Year FE</i>	no	no	no	no	no	no	no	no	no	no
<i>Bank, Industry FE</i>	Yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes
<i>Observations</i>	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883
<i>Pseudo R-squared</i>	0.110	0.110	0.113	0.111	0.110	0.205	0.205	0.138	0.138	0.137

**Table 6**  
**Considering other valuation models used by analysts**

Panel A reports all the major valuation models used by analysts. We classify the models into two broad categories: absolute models and relative models. In Panel A, we report the models with an average of at least 3% used by analysts in their reports. Absolute models include DCF and NAV. Relative models include PE, PB, PSAL and PCF. Panel B reports the determinants of using absolute models against relative models. The dependent variable *Absolute* is an indicator, which equals to one if the dominant valuation model is absolute model and zero if the dominant model is relative model. We use *Earnings* and *Accrual* (*CF\_std*) to capture investor demand for cash flow information, and use firm risk variables *CF\_std*, *Loss*, and *Retstd12* to capture investor demand for discount rate information. Panel C reports the determinants of using DCF against PCF model. The dependent variable is *DCF\_PCF*, which equals to one if the dominant valuation model is DCF and zero if the dominant model is PCF. Control variables are the same as in Table 3. For brevity, we do not report them. The definitions of other variables are in Appendix D. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for firm and year clustering. . \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 level, respectively.

*Panel A Valuation models distributions over the years*

Year	N. (Reports)	Absolute Model (%)			Relative Model (%)				
		Abs_ total	DCF	NAV	Rel_ total	PE	PB	PSAL	PCF
1997	3,903	4.69	2.95	1.90	95.31	94.18	1.90	1.82	1.00
1998	7,932	4.87	2.60	2.46	95.13	93.27	1.20	3.74	0.87
1999	12,121	4.76	3.24	1.64	95.24	93.66	1.11	3.10	1.11
2000	24,587	5.93	4.41	1.47	94.07	90.48	0.90	3.81	0.88
2001	33,191	7.56	5.79	1.50	92.44	90.09	1.57	3.37	0.98
2002	37,810	12.26	10.44	1.67	87.74	84.64	2.78	2.90	2.90
2003	34,929	18.51	16.08	2.53	81.49	78.07	4.10	2.52	5.33
2004	39,968	21.58	18.66	3.08	78.42	74.32	3.81	3.20	3.28
2005	41,328	22.75	19.73	3.52	77.25	73.30	4.39	3.32	3.68
2006	34,128	20.21	17.68	3.21	79.79	74.31	3.20	2.71	3.29
2007	35,778	22.88	19.74	4.08	77.12	71.69	4.44	2.95	3.94
2008	34,837	27.18	22.76	5.56	72.82	65.80	6.39	3.69	3.55
2009	30,118	30.48	23.48	8.37	69.52	63.92	6.01	3.68	3.17
2010	32,971	26.20	21.89	5.14	73.80	68.31	5.57	3.06	3.75
2011	35,279	27.08	22.91	4.44	72.92	65.48	5.64	2.91	4.47
2012	35,206	28.50	23.58	4.77	71.50	64.16	5.86	3.28	4.24
2013	32,978	27.28	22.34	4.76	72.72	65.72	5.75	3.18	5.06
2014	36,387	25.40	20.26	4.63	74.60	68.89	4.93	2.41	4.65
2015	34,321	23.89	18.84	4.61	76.11	70.20	4.94	2.41	5.33
Total/Mean	577,772	21.23	19.29	3.65	80.95	76.34	3.92	3.06	3.24

*Panel B Absolute vs Relative Models (total observations= 577,772, including 122,647 using Absolute models and 457,934 using relative models)*

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Earnmgmt</i>	1.263*** (5.00)					0.344 (1.43)
<i>Accrual</i>		1.406*** (4.68)				0.612** (2.41)
<i>CF_std</i>			2.901*** (5.59)			2.212*** (4.70)
<i>Loss</i>				0.340*** (4.15)		0.269*** (3.65)
<i>Retstd12</i>					0.040 (1.46)	-0.016 (-0.70)
<i>Controls</i>	yes	yes	yes	yes	yes	yes
<i>Year,Bank, Industry FE</i>	yes	yes	yes	yes	yes	yes
<i>Observations</i>	577,772	577,772	577,772	577,772	577,772	577,772
<i>Pseudo R-squared</i>	0.126	0.126	0.127	0.126	0.125	0.128

*Panel C DCF vs PCF Models (total observations= 122,610, including 101,809 using DCF model and 20,801 using PCF model)*

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Earnmgmt</i>	0.218 (0.50)					-0.228 (-0.54)
<i>Accrual</i>		0.111 (0.22)				-0.520 (-0.99)
<i>CF_std</i>			2.972*** (3.86)			2.694*** (3.50)
<i>Loss</i>				0.298*** (3.36)		0.238*** (2.64)
<i>Retstd12</i>					0.129*** (3.32)	0.093** (2.51)
<i>Controls</i>	yes	yes	yes	yes	yes	yes
<i>Year,Bank, Industry FE</i>	yes	yes	yes	yes	yes	yes
<i>Observations</i>	122,610	122,610	122,610	122,610	122,610	122,610
<i>Pseudo R-squared</i>	0.079	0.079	0.081	0.080	0.081	0.083

**Table 7****Alternative measurement of analyst cash flow and discount rate discussions**

We redefine analyst cash flow and discount rate discussions by ranking *RepCF* (*RepDR*) by bank year in quintiles. We have two new measurements: *RepCF5d*, the rank of *RepCF* by bank year, range from 1 to 5, and *RepDR5d*, the rank of *RepDR* by bank year, range from 1 to 5. We then repeat the analyses in table 4 but with tobit regressions. Control variables are the same as in Table 3. For brevity, we do not report them. The definitions of other variables are provided in Appendix D. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for firm and year clustering. . \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 level, respectively

	(1) RepCF5d	(2) RepCF5d	(3) RepDR5d	(4) RepDR5d	(5) RepDR5d
<i>Earnmgmt</i>	0.781*** (2.83)				
<i>Accrual</i>		2.039*** (7.19)			
<i>CF_std</i>			6.611*** (5.85)		
<i>Loss</i>				1.130*** (8.19)	
<i>Retstd12</i>					0.063 (1.33)
<i>Controls</i>	yes	yes	yes	yes	yes
<i>Year,Bank, Industry FE</i>	yes	yes	yes	yes	yes
<i>Observations</i>	527,883	527,883	527,883	527,883	527,883
<i>Pseudo R-squared</i>	0.066	0.067	0.048	0.049	0.048

**Table 8 The informativeness of valuation models: Recommendations**

This table reports the economic consequences of using different valuation models. The dependent variable  $CAR_t$  is the cumulated abnormal return starting from one day before to  $t$  days after the report date. *Buy* (*Sell*) is an indicator of analyst buy (sell) recommendations. *DCF* equals to one if the dominant valuation model in an analyst report is DCF model, and zero otherwise. *RepCF* and *RepDR* is the number of cash flow and discount rates keywords discussed by analysts in their reports respectively. Panel A reports the baseline analysis. Panel B examines whether the market reactions differences observed in Panel A column (1) to (4) are more pronounced when the DCF model is accompanied with more cash flow and discount rate discussions. The definitions of other variables are provided in Appendix D. In the parentheses below coefficient estimates are robust  $t$ -statistics based on standard errors adjusted for firm and year clustering. \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels, respectively.

*Panel A Baseline analysis*

	(1) CAR3	(2) CAR30	(3) CAR183	(4) CAR365	(5) CAR3	(6) CAR30	(7) CAR183	(8) CAR365	(9) CAR3	(10) CAR30	(11) CAR183	(12) CAR365
<i>Buy</i>	0.435*** (14.34)	-0.224 (-1.43)	-2.344*** (-4.12)	-3.347*** (-4.19)	0.398*** (10.74)	-0.285 (-1.57)	-2.454*** (-3.58)	-3.489*** (-3.59)	0.426*** (13.25)	-0.215 (-1.25)	-2.275*** (-3.50)	-3.240*** (-3.59)
<i>Sell</i>	-0.522*** (-7.98)	-0.401 (-1.34)	0.284 (0.26)	0.885 (0.57)	-0.355*** (-6.90)	-0.160 (-0.53)	0.436 (0.40)	0.926 (0.59)	-0.450*** (-8.41)	-0.249 (-0.82)	0.538 (0.47)	1.022 (0.64)
<i>DCF</i>	-0.118** (-2.17)	-0.421** (-2.13)	-0.581 (-0.98)	-0.676 (-0.83)								
<i>Buy*DCF</i>	<b>0.157**</b> <b>(2.54)</b>	<b>0.530**</b> <b>(2.39)</b>	0.746 (1.22)	0.824 (1.13)								
<i>Sell*DCF</i>	0.332*** (3.03)	0.411 (1.10)	-0.007 (-0.01)	-0.657 (-0.51)								
<i>RepCF</i>					0.004 (0.61)	0.004 (0.24)	0.065 (1.35)	0.091 (1.27)				
<i>Buy*RepCF</i>					<b>0.020***</b> <b>(3.17)</b>	<b>0.048**</b> <b>(2.29)</b>	0.071 (0.99)	0.083 (0.85)				
<i>Sell*RepCF</i>					-0.032* (-1.78)	-0.051 (-1.51)	-0.046 (-0.63)	-0.051 (-0.51)				
<i>RepDR</i>									-0.012 (-1.30)	-0.068*** (-2.59)	-0.077 (-0.99)	-0.062 (-0.65)
<i>Buy*RepDR</i>									<b>0.032***</b> <b>(3.84)</b>	<b>0.076*</b> <b>(1.85)</b>	0.062 (0.47)	0.044 (0.28)
<i>Sell*RepDR</i>									-0.002 (-0.10)	-0.052 (-0.75)	-0.197 (-1.02)	-0.209 (-1.04)
<i>Logmv</i>	-0.162*** (-4.93)	-1.077*** (-6.84)	-3.704*** (-6.55)	-5.018*** (-6.04)	-0.160*** (-4.90)	-1.073*** (-6.85)	-3.692*** (-6.56)	-5.002*** (-6.05)	-0.162*** (-4.91)	-1.076*** (-6.84)	-3.704*** (-6.55)	-5.017*** (-6.04)
<i>Salesgrowth</i>	-0.003*** (-3.65)	-0.007** (-2.05)	-0.031** (-2.57)	-0.052*** (-3.02)	-0.003*** (-3.68)	-0.007** (-2.07)	-0.031** (-2.57)	-0.053*** (-3.03)	-0.003*** (-3.66)	-0.007** (-2.05)	-0.030** (-2.56)	-0.052*** (-3.01)
<i>Beta</i>	-0.341* (-1.78)	-1.466** (-2.05)	-1.382 (-1.38)	-0.482 (-0.48)	-0.332* (-1.78)	-1.444** (-2.05)	-1.309 (-1.30)	-0.383 (-0.38)	-0.341* (-1.78)	-1.464** (-2.05)	-1.378 (-1.37)	-0.475 (-0.47)

<i>Arpre12</i>	(-1.95) 0.037*** (18.92)	(-2.39) 0.154*** (21.66)	(-0.78) 0.449*** (23.56)	(-0.19) 0.533*** (18.72)	(-1.90) 0.037*** (18.93)	(-2.36) 0.154*** (21.66)	(-0.74) 0.449*** (23.53)	(-0.16) 0.533*** (18.70)	(-1.94) 0.037*** (18.93)	(-2.39) 0.154*** (21.67)	(-0.78) 0.449*** (23.57)	(-0.19) 0.533*** (18.72)
<i>Repwords</i>	0.035 (1.07)	-0.008 (-0.09)	-0.193 (-0.68)	-0.053 (-0.11)	0.005 (0.17)	-0.075 (-0.89)	-0.413 (-1.37)	-0.345 (-0.65)	0.029 (0.90)	0.008 (0.09)	-0.161 (-0.57)	-0.029 (-0.06)
<i>Indexpert</i>	-0.075* (-1.81)	-0.423*** (-2.64)	-0.817** (-2.01)	-0.664 (-1.18)	-0.075* (-1.82)	-0.424*** (-2.64)	-0.814** (-2.01)	-0.659 (-1.17)	-0.074* (-1.81)	-0.425*** (-2.65)	-0.820** (-2.02)	-0.666 (-1.18)
<i>Firmexp</i>	-0.000 (-0.03)	0.033 (1.05)	0.148** (1.98)	0.203** (2.21)	-0.000 (-0.02)	0.034 (1.09)	0.151** (2.03)	0.208** (2.30)	-0.000 (-0.03)	0.033 (1.05)	0.148** (1.99)	0.204** (2.25)
<i>CFA</i>	0.052 (1.28)	0.051 (0.33)	0.180 (0.46)	0.025 (0.05)	0.054 (1.34)	0.053 (0.34)	0.175 (0.45)	0.016 (0.03)	0.053 (1.33)	0.053 (0.35)	0.180 (0.46)	0.022 (0.04)
<i>Constant</i>	1.267*** (3.34)	8.942*** (5.33)	28.473*** (4.46)	26.140*** (2.80)	1.448*** (3.82)	9.323*** (5.28)	29.743*** (4.41)	27.829*** (2.78)	1.300*** (3.56)	8.815*** (5.28)	28.194*** (4.39)	25.879*** (2.75)
<i>Year, Bank, Industry FE</i>	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>Observations</i>	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883	527,883
<i>R-squared</i>	0.092	0.307	0.457	0.443	0.092	0.307	0.457	0.443	0.092	0.307	0.457	0.443

*Panel B Subsamples where analysts make high and low cash flow and discount rate discussions*

	(1) CAR3	(2) CAR3	(3) CAR3	(4) CAR3	(5) CAR365	(6) CAR365	(7) CAR365	(8) CAR365
	RepCF high	low	RepDR high	low	RepCF high	low	RepDR high	low
<i>Buy</i>	0.495*** (10.94)	0.338*** (7.67)	0.428*** (11.39)	0.446*** (10.13)	-4.632*** (-5.08)	-1.155*** (-2.58)	-4.382*** (-4.23)	-1.710*** (-4.30)
<i>Sell</i>	-0.721*** (-6.62)	-0.313*** (-4.06)	-0.547*** (-6.16)	-0.462*** (-5.95)	1.505 (0.65)	1.088 (1.12)	0.952 (0.43)	1.338 (1.14)
<i>DCF</i>	-0.115** (-2.06)	-0.128 (-0.98)	-0.118** (-2.36)	-0.151 (-0.73)	-1.272 (-1.19)	-0.826 (-0.81)	-1.444 (-1.46)	1.228 (0.66)
<i>Buy*DCF</i>	<b>0.137*</b> <b>(1.85)</b>	0.126 (0.76)	<b>0.188***</b> <b>(2.92)</b>	-0.034 (-0.17)	<b>1.848**</b> <b>(2.19)</b>	0.215 (0.21)	<b>2.180**</b> <b>(2.23)</b>	-0.836 (-0.45)
<i>Sell*DCF</i>	0.425*** (3.75)	0.464 (1.59)	0.353*** (3.27)	0.191 (0.34)	-1.006 (-0.57)	-1.521 (-0.88)	-0.765 (-0.41)	-3.335 (-1.07)
<i>Controls</i>	yes	yes	Yes	yes	yes	yes	yes	yes
<i>Year, Bank, Industry FE</i>	yes	yes	Yes	yes	yes	yes	yes	yes
<i>High-Low Diff (P-value)</i>	0.9166		0.2951		0.0075		0.0072	
<i>Observations</i>	351,287	176,596	375,578	152,305	351,287	176,596	375,578	152,305
<i>R-squared</i>	0.088	0.103	0.091	0.098	0.417	0.509	0.421	0.511

**Table 9 The informativeness of valuation models: Target price changes**

This table uses analyst target price changes to test the informativeness of valuation models. We then repeat the analyses in Table 9. The dependent variable  $CAR_t$  is the cumulated abnormal return starting from one day before to  $t$  days after the report date.  $TPchg$  is the change of analyst target price forecast scaled by the stock price at the beginning of the year.  $DCF$  equals to one if the dominant valuation model in an analyst report is DCF model, and zero otherwise.  $RepCF$  and  $RepDR$  is the number of cash flow and discount rates keywords discussed by analysts in their reports respectively. Panel A reports the baseline analysis. Panel B examines whether the market reactions differences observed in Panel A column (1) to (4) are more pronounced when the DCF model is accompanied with more cash flow and discount rate discussions. The definitions of other variables are provided in Appendix D. In the parentheses below coefficient estimates are robust  $t$ -statistics based on standard errors adjusted for firm and year clustering. \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, and 0.01 levels, respectively.

*Panel A Baseline analysis*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	CAR3	CAR30	CAR183	CAR365	CAR3	CAR30	CAR183	CAR365	CAR3	CAR30	CAR183	CAR365
<i>TPchg</i>	5.161*** (9.72)	2.057** (2.35)	-13.738*** (-10.13)	-19.337*** (-7.87)	4.963*** (10.07)	2.102** (2.29)	-12.910*** (-9.60)	-18.037*** (-7.53)	5.061*** (10.16)	2.009** (2.43)	-13.603*** (-9.36)	-19.029*** (-7.73)
<i>DCF</i>	0.009 (0.20)	-0.095 (-0.62)	-0.176 (-0.46)	-0.274 (-0.49)								
<i>TPchg*DCF</i>	<b>0.673</b> <b>(1.48)</b>	<b>1.393*</b> <b>(1.79)</b>	<b>3.143**</b> <b>(2.19)</b>	<b>4.748***</b> <b>(2.60)</b>								
<i>RepCF</i>					0.008 (1.54)	0.021 (1.29)	0.093** (1.99)	0.143** (2.06)				
<i>TPchg*RepCF</i>					<b>0.099**</b> <b>(2.19)</b>	0.069 (0.76)	-0.067 (-0.34)	-0.116 (-0.39)				
<i>RepDR</i>									-0.005 (-0.54)	-0.051* (-1.92)	-0.105** (-1.99)	-0.092 (-1.41)
<i>TPchg*RepDR</i>									<b>0.177***</b> <b>(3.05)</b>	<b>0.253**</b> <b>(2.19)</b>	0.387 (1.43)	0.499 (1.28)
<i>Controls</i>	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>Year, Bank, Industry FE</i>	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes
<i>Observations</i>	447,940	447,940	447,940	447,940	447,940	447,940	447,940	447,940	447,940	447,940	447,940	447,940
<i>R-squared</i>	0.106	0.316	0.471	0.460	0.106	0.316	0.471	0.460	0.106	0.316	0.471	0.460

*Panel B Subsamples where analysts make high and low cash flow and discount rate discussions*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CAR3	CAR3	CAR3	CAR3	CAR365	CAR365	CAR365	CAR365
	RepCF		RepDR		RepCF		RepDR	
	high	low	High	low	high	low	high	low
<i>TPchg</i>	5.351*** (7.45)	4.766*** (10.45)	4.861*** (7.98)	5.800*** (10.04)	-20.425*** (-8.05)	-16.750*** (-5.87)	-20.895*** (-8.37)	-16.374*** (-5.08)
<i>DCF</i>	0.015 (0.25)	-0.003 (-0.04)	0.025 (0.57)	-0.024 (-0.15)	-0.360 (-0.50)	-0.723 (-0.90)	-0.352 (-0.58)	0.818 (0.50)
<i>TPchg*DCF</i>	<b>0.915</b> <b>(1.44)</b>	-0.558 (-0.82)	<b>1.169**</b> <b>(1.98)</b>	-2.716* (-1.88)	<b>6.258***</b> <b>(2.96)</b>	2.248 (1.02)	<b>7.040***</b> <b>(3.25)</b>	0.302 (0.06)
<i>Controls</i>	yes	yes	Yes	yes	yes	yes	yes	yes
<i>Year, Bank, Industry FE</i>	yes	yes	Yes	yes	yes	yes	yes	yes
<i>High-Low Diff (P-value)</i>	0.0049		0.0001		0.1156		0.1561	
<i>Observations</i>	301,225	146,715	323,326	124,614	301,225	146,715	323,326	124,614
<i>R-squared</i>	0.102	0.118	0.104	0.115	0.434	0.522	0.440	0.520